

**SYSTEM FOR ENHANCING THE TRANSMISSION SECURITY
OF THE E-MAILS IN THE INTERNET NETWORK**

Technical field of the invention

The present invention relates to the security in the
5 transmission of the e-mails over an unsecured data
transmission network and in particular relates to a system for
enhancing the transmission security of the e-mails in the
Internet network.

Background art

10 Today, the use of e-mails is widely spread. When the sender
forwards an e-mail to a recipient, the action is immediate and
unless a problem is encountered between the sender server and
the recipient server, the e-mail is delivered in the recipient
mailbox without any control on the way taken by the forwarded
15 message in terms of network infrastructure.

Most countries have specific legal protections that prevent
authorities and individuals from opening and reading the paper
mail. Unfortunately, few countries have provided the same
protections for the electronic mail, which gives individuals,
20 companies and authorities a legal room to read the e-mails.
Thus, the e-mails can be read at any of the routers along the
path taken by the e-mail to reach its destination over the
Internet. However, due to the growth of commercial and private
contracts materialized by the electronic mail, it becomes
25 crucial to be able to guarantee privacy of such exchanges.

To prevent attacks of e-mails, the usage of encryption
algorithms either symmetric or asymmetric to secure the e-mail
exchange over the Internet is widely spread. Thus, in the key

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encryption, there is a private key kept private for the owner, which is used to sign the data whereas a public key which can be known of many people is used for decrypting the message. To improve the security, such keys have a minimum of 40 bits but
5 are longer and longer. For example, the symmetric algorithm Data Encryption Standard specifies 56-bit keys in some countries and 128-bit keys in other ones like the USA. Therefore, there is no doubt that such a continuous growth of the key length is not a solution for the security problem.

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Summary of the invention

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Accordingly, the object of the invention is to provide a system and to achieve a method which can be adapted to any kind of e-mail being transmitted over the Internet network without requiring the use of sophisticated algorithms and/or
15 more and more long encryption keys.

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The invention therefore relates to a system for enhancing the security of the e-mails transmitted from a sender to a receiver over a data transmission network such as Internet wherein a Message Transfer Agent (MTA) associated with the
20 sender is in charge of transmitting over the network an original e-mail sent by the sender. The MTA associated with the sender includes a message splitting means adapted to divide the original e-mail into a plurality of chunks according to a predetermined algorithm and a predetermined
25 list of relay MTAs to which are forwarded the plurality of chunks. The system comprises a chunk assembly agent for receiving from the relay MTAs the plurality of chunks and re-assembling them by using the predetermined algorithm in order to re-build the e-mail before sending it to the receiver

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Brief description of the drawings

The above and other objects, features and advantages of the invention will be better understood by reading the following more particular description of the invention in conjunction
5 with the accompanying drawings wherein:

▪ Fig. 1 is a schematic representation of a system according to the invention wherein an e-mail is divided into three chunks using three different paths over Internet; and

10 ▪ Fig. 2 is a diagram representing the original e-mail divided into five chunks distributed among three different e-mails.

Detailed description of the invention

In reference to FIG.1, in the system according to the invention, it is assumed that a sender 10 wants to send an
15 e-mail to a receiver 12 over the public data transmission network, that is Internet, represented inside the dotted lines in the figure.

The e-mail MSG sent by the sender 10 can be encrypted by the public key of the receiver 12 even though this is not
20 mandatory. The e-mail MSG preferably encrypted is then provided for transmission to the associated Message Transfer Agent (MTA) 14 after adding a mail header such as the e-mail COMPLETE MSG to be forwarded is as follows:

To : receiver@dest.domain
25 From : sender
Subject : secure mail
ENCRYPTED TEXT

wherein receiver@dest.domain is the address of the receiver mailbox. It must be noted that this address is in clear

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insofar as the sender MTA 14 is a secure zone that can be the Intranet network of a company or the client device of a standalone user.

The sender MTA 14 includes two essential means according to the invention : a message splitter agent 16 and a list of relay MTAs 18. The message splitter agent 16 is in charge of dividing the received e-mail COMPLETE MSG into a plurality of chunks and to encrypt each chunk with its mail header by using the public key of a specific mailbox having the address highlysecure@dest.dom. Each new e-mail MSG CHUNK is as follows:

To : receiver@dest.domain
From : sender
Subject : secure mail
15 Chunk : n
Chunk count : N

A same MAIL HEADER is added to each encrypted chunk before sending it over the Internet network. This MAIL HEADER is as follows :

20 To highlysecure@dest.domain
From : Confidential
Subject : xxx

By using its list of relay MTAs 18, the sender MTA 14 forwards each encrypted chunk with its header to a different relay MTA. Thus, in the example illustrated in FIG.1, the e-mail is divided into three e-mails forwarded to the relay MTAs 20, 22 and 24. Thus, sending a plurality of chunks to respectively a plurality of MTAs ensures a different pathway for each chunk while they transit over the unsecured public network. It must

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be noted that such a division into chunks can depend on the security level required by the sender.

Since all the chunk e-mails have the same destination address highlysecure@dest.domain, they are received by a single
5 deliver MTA 26 associated with this address. Then, the deliver MTA sends the received chunk e-mails to the mailbox corresponding to the address highlysecure@dest.domain which is a chunk assembly agent 28. By using its private key, the chunk
assembly agent 28 decrypts each received e-mail and can
10 re-assemble the plurality of received chunks by using the same algorithm which has been used by the message splitter agent to divide the original e-mail into a plurality of chunks, the chunk number n included in the header being used to concatenate the chunks in the right order even if they have
15 been received in a different order.

Finally, the original message COMPLETE MSG which has been obtained after re-assembling the chunks in the chunk assembly agent 28, is forwarded to the mailbox of the receiver 12 by the deliver MTA 26.

20 The scrambling algorithm used to divide the original e-mail into a plurality of chunks may be any kind of algorithm. But as mentioned above, it is essential that the chunk assembly agent uses the same algorithm to re-assemble the e-mail as the one used by the message splitter agent to divide the e-mail
25 into chunks.

For instance, it can be assumed that each chunk is composed of the same number of n bytes. Assuming that there are m relay MTAs, the original e-mail could be divided in the following way:

30 Bytes from 1 to n in chunk #1 for the first relay MTA
Bytes from $n+1$ to $2n$ in chunk #2 for the second relay MTA

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Bytes from $2n+1$ to $3n$ in chunk #3 for the third relay MTA

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Bytes from $mn+1$ to $(m+1)n$ in chunk # $m+1$ for the m^{th} relay MTA

Bytes from $(m+1)n+1$ to $(m+2)n$ in chunk # $m+2$ for the first
5 relay MTA

Bytes from $(m+2)n+1$ to $(m+3)n$ in chunk # $m+3$ for the second
relay MTA

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10 According to another more secure embodiment, the original e-mail may be divided at the character level. A possible algorithm consists in taking sequentially each character and put it in a chunk the number of which is defined by the following formula used with X chunks:

Chunk # = $1 + \langle \text{order number of the character} \rangle \text{ modulo } X$

15 Assuming that the message is "DIVIDE THE MESSAGE" and that the characters are put into 5 chunks, the chunks are the following:

Chunk 1 DE A

Chunk 2 I MG

20 Chunk 3 VTEE

Chunk 4 IHS

Chunk 5 DES

Then, the chunks could be distributed randomly into the different e-mails forwarded to the relay MTAs.

25 Thus, assuming that there are three relay MTAs as described in FIG.1, the original e-mail could be divided into 5 chunks as illustrated in FIG.2. In such a case, chunk #1 and chunk #4 are included in the e-mail forwarded to relay MTA 20, chunk #2 and chunk #5 are included in the e-mail forwarded to relay MTA
30 22 and chunk #3 is forwarded to relay MTA 24. It must be noted that each chunk is preceded, in each e-mail, by the chunk

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number in order for the chunk assembly agent 28 to be able to re-assemble correctly the original e-mail even though the partial e-mails are not received in the right order.